PROC. ENTOMOL. SOC. WASH.
107(1), 2005, pp. 71–77

# A NEW SPECIES OF *DORSIPES* REGENFUSS (ACARI: PODAPOLIPIDAE), ECTOPARASITE OF *AMARA LATIOR* KIRBY (COLEOPTERA: CARABIDAE) FROM ARIZONA

ROBERT W. HUSBAND AND DAVID O. HUSBAND

(RWH) 1035 Scottdale Drive, Adrian, MI 49221, U.S.A. (e-mail: husbandadrian@aol.com); (DOH) 346 Jamacha, Apt. 61, E. Cajon, CA 92019, U.S.A. (e-mail: davidhsbnd@aol.com)

*Abstract.*—***Dorsipes amarae*, new species**, is a podapolipid mite that parasitizes *Amara latior* Kirby (Coleoptera: Carabidae) in Arizona, U.S.A. It belongs to the *inflatus* group of *Dorsipes* Regenfuss and represents the first record of the group in the western hemisphere. The new species and three additional species of *Dorsipes* in the group *inflatus* are compared with each other and a key to adult females is provided.

*Key Words:* beetle, parasitic mite, Carabidae, Podapolipidae, Arizona

Mites in the family Podapolipidae (Acari: Tarsonemina) are highly specialized ecto- and endoparasites of insects of the orders Blattaria, Orthoptera, Heteroptera, Hymenoptera, and especially Coleoptera. Regenfuss (1968) proposed the genus *Dorsipes* and described seven species from carabid beetles found in Germany, two of them in the *inflatus* group. Husband and Kurosa (2002) described new species in the *dorsipes* group from Japan and discussed differences among the *dorsipes, inflatus,* and *platysmae* groups. Kurosa and Husband (2002) added *Dorsipes curtonoti* from Japan to the *inflatus* group and discussed changes in *inflatus* group concepts based on new discoveries. It is the purpose of this paper to describe the first member of the *inflatus* group found on American carabid beetles and compare it with other species in the *inflatus* group.

## MATERIALS AND METHODS

Sixty specimens of *Amara* species (Carabidae) in the University of Michigan Museum of Zoology (UMMZ) were examined for mites by the senior author. Many representatives of all life stages of a new *Dorsipes* species were found under the elytra of *Amara latior* Kirby collected from Coconino County, Arizona, U.S.A.

Measurements in micrometers (μm) were taken with the aid of a Zeiss phase contrast compound microscope with an ocular micrometer. Setae that are no longer than the diameters of setal acetabulae are listed as microsetae (m). Setae with only an acetabulum and no remnant of a setal base are listed as vestigial setae (v). Often long setae are obscured, bent, broken or at an angle which makes measurement difficult. Setae are at least as long as indicated. Terminology follows Lindquist (1986).

## *Dorsipes amarae* Husband and Husband, new species

(Figs. 1–3)

Diagnosis.—With traits of the *inflatus* group: Vagina expanded distally with opening somewhat dorsal, setae *f* not present, with strong ambulacrum I claw, tarsus II without solenidion, coxal setae 3*a* not pres-

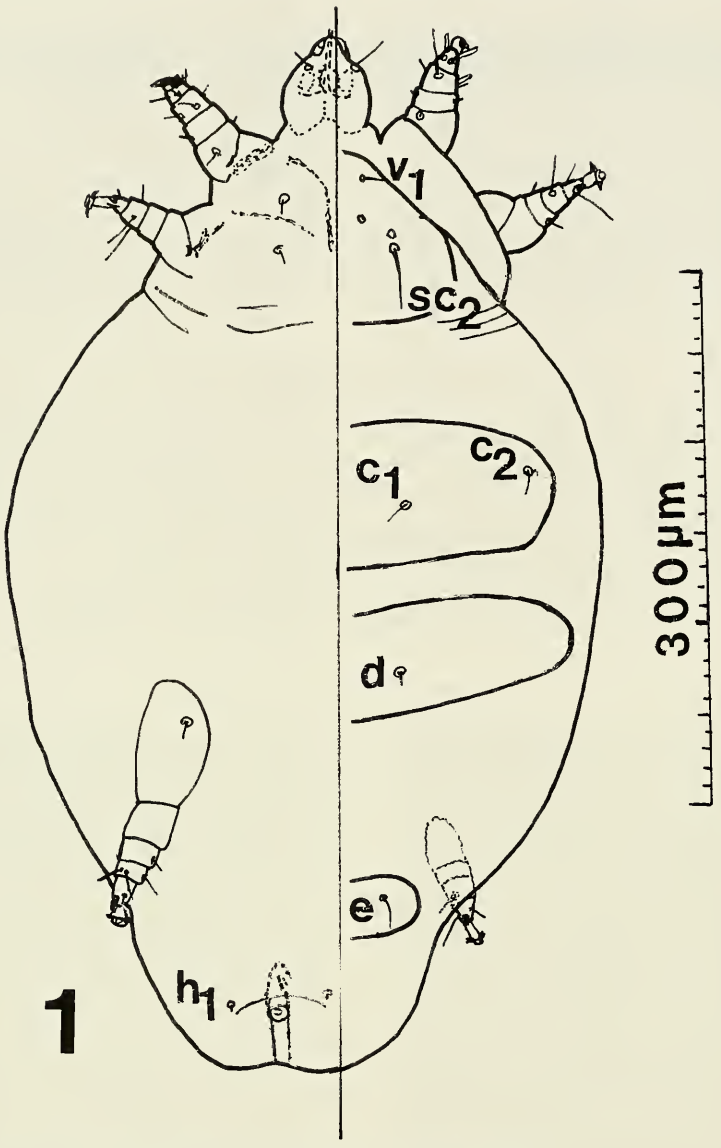


Fig. 1. *Dorsipes amarae*, adult female, ventral (left) and dorsal aspects.

ent, setae $v_1$ conspicuous, larval female without femur III setae (most species), with setae $h_1$ widely separated, genital capsule of male wider at base than at apex. Setae *e* and *f* on plate EF occur in *dorsipes*, coxal setae 3*a* occur in *platysmae*, setae *f* not present in *platysmae* and *inflatus*, setae 3*a* not present in *inflatus* nor in all but one *dorsipes*.

Female *Dorsipes amarae* without stigmata and setae $h_2$. Stigmata present in *D. notopus* Regenfuss, 1968, and *D. curtonoti* Kurosa and Husband, 2002. Vestigial setae $h_2$ clear in female *D. inflatus* Regenfuss, 1968, *D. notopus* and *D. curtonoti*. Female *D. amarae* with genu III setae *l''*, *D. inflatus* without setae *l'*. Genital capsule of male *D. amarae* with broad base similar to capsule of *D. inflatus*. Setae $c_2$ 5–8 in *D. amarae*, 3 in *D. inflatus*. Setae $c_2$ anterior to setae $c_1$

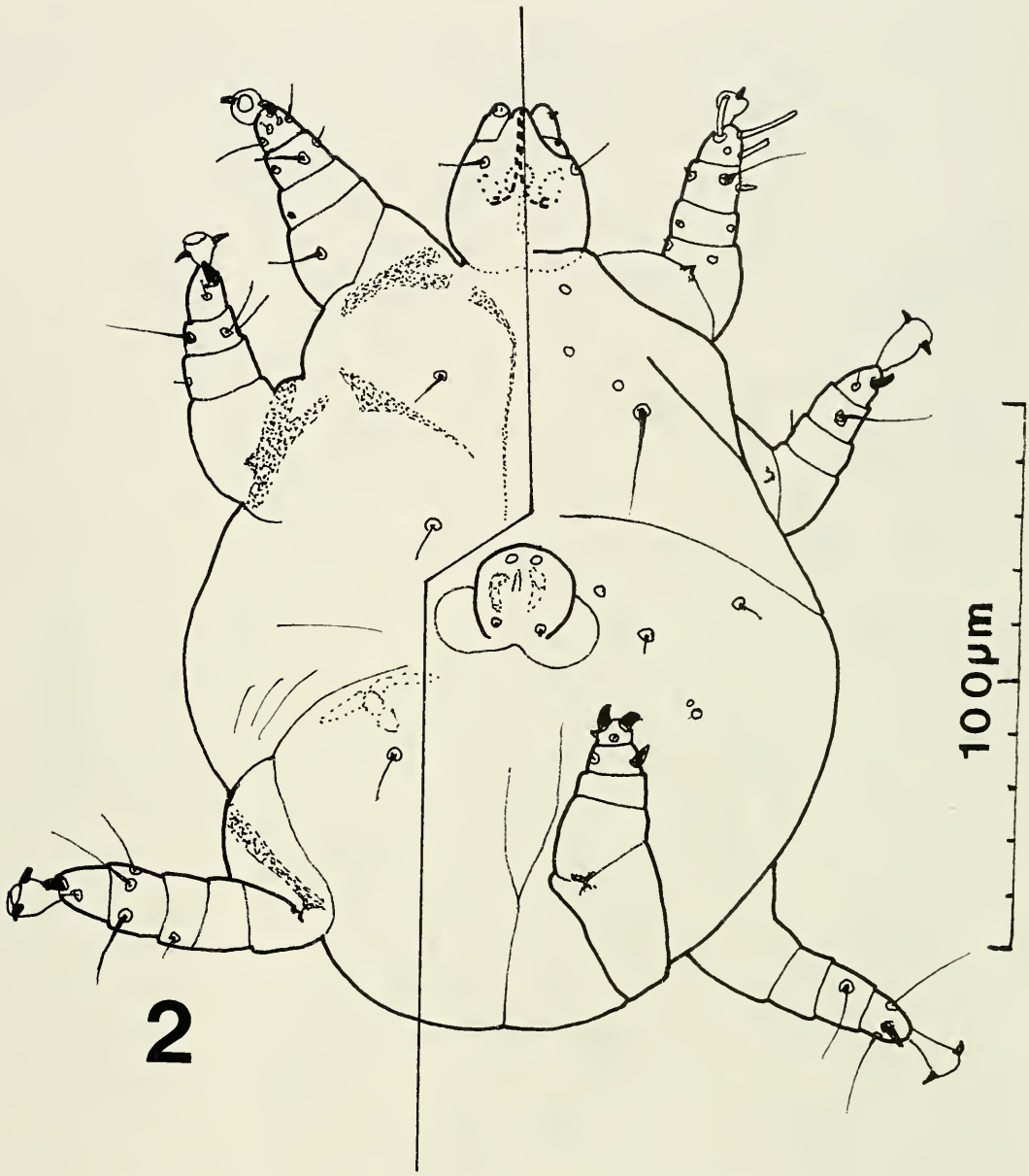


Fig. 2. *Dorsipes amarae,* male, ventral (left) and dorsal aspects.

in *D. amarae,* lateral to $c_1$ in male *D. inflatus, D. notopus* and *D. curtonoti.* Setae $v_1$ longer in larval *D. amarae* (25–32), shorter in *D. notopus* (12–17) and *D. curtonoti* (11–13). Genu III setae *l″* 8–10 in larval *D. amarae,* not present in *D. inflatus* or *D. notopus.* Metrical data of dorsal and ventral gnathosomal setae, idiosomal setae $c_1$, and femur seta *d* in adult female, cheliceral stylets, and idiosomal setae $sc_2$ in male, cheliceral stylets and idiosomal setae $_1$ and $c_2$ in larval female potentially useful in discrimination of species (Table 1).

Adult female (Fig. 1).—*Gnathosoma:* Length 55–60, width 50–62 (n = 6). Palp length 17–20; cheliceral stylet length 48–55

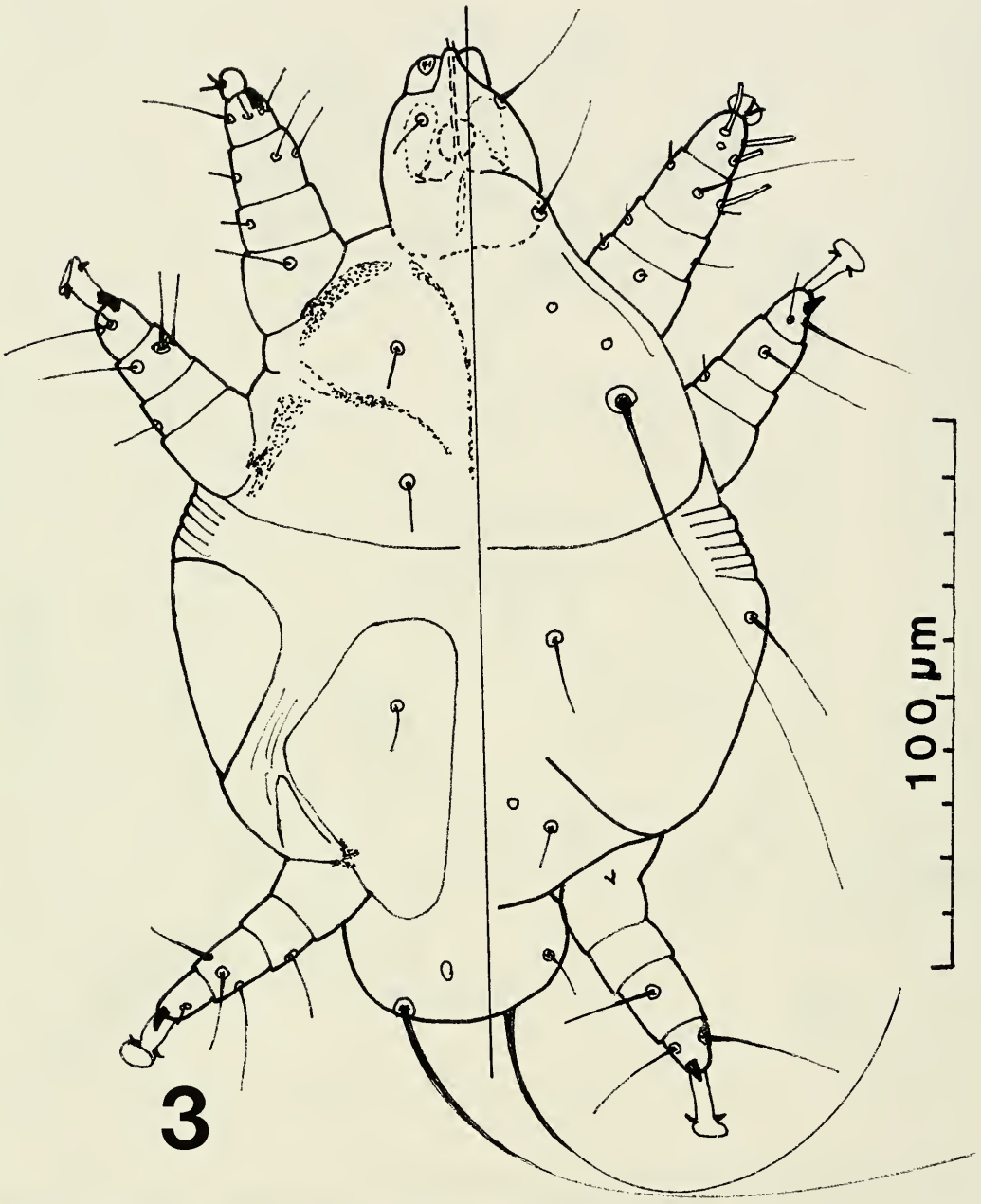


Fig. 3. *Dorsipes amarae,* larval female, ventral (left) and dorsal apsects.

with 2 basal sclerites, pharynx width 12–13; dorsal gnathosomal setae 24–27, ventral setae 12–17, distance between ventral setae 18–25. Stigmata not evident.

*Idiosoma:* Length 248–550, width 186–380. Prodorsal plate length 95, width 160; setae $v_1$ 15–18, $v_2$ and $sc_1$ vestigial, $sc_2$ 36–46. Distance between setae $v_1$ 46–54, $v_2$ medial to and $sc_1$ near a line connecting $v_1$ and $sc_2$. Plate C length 80, width 258; setae $c_1$ 13–15, setae $c_2$ 18–22. Setae $d$ 11–12, setae $e$ 10–13, setae $f$ absent, setae $h_1$ 3–5, distance between setae $h_1$ 47–54.

*Venter:* Apodemes 1 moderately devel-

Table 1. Comparison of selected maximum measurements for *Dorsipes inflatus (Din), D. notopus (Dno), D. curtonoti (Dcu),* and *D. amarae (Dam)* of the *inflatus* group or *Dorsipes*. Measurements are in micrometers.

| Character | *Din* | *Dno* | *Dcu* | *Dam* |
|---|---|---|---|---|
| ADULT FEMALES | | | | |
| Idiosomal length | 370 | 505 | 600 | 550 |
| Idiosomal width | 321 | 415 | 398 | 380 |
| Cheliceral stylets | 38 | 50 | 53 | 55 |
| Pharynx width | 14 | 15 | 20 | 13 |
| Dorsal gnath. setae | 23 | 30 | 35 | 27 |
| Ventral gnath. setae | 12 | 13 | 20 | 17 |
| Idiosomal setae | | | | |
| $v'$ | 9 | 10 | 8 | 18 |
| $c_1$ | 10 | 18 | 16 | 15 |
| $c_2$ | 20 | 35 | 40 | 22 |
| $h_2$ | *v* | *v* | *v* | 0 |
| Femur I seta *d* | 3 | *m* | 5 | 3 |
| Femur II seta *d* | 0 | 0 | 5 | 0 |
| Tarsus II seta *pv'* | 3 | 0 | 4 | 3 |
| Genu III seta *l''* | 0 | 6 | 5 | 9 |
| MALES | | | | |
| Idiosomal length | 155 | 192 | 178 | 180 |
| Idiosomal width | 134 | 151 | 136 | 157 |
| Cheliceral stylets | 25 | 20 | 17 | 24 |
| Dors. gnath. setae | 5 | 7 | 11 | 8 |
| Idiosomal setae | | | | |
| $sc_2$ | 29 | 33 | 62 | 40 |
| $c_1$ | *m* | *m* | 6 | 3 |
| Genit. cap. length | 26 | 27 | 28 | 28 |
| Genit. cap. width | 32 | 32 | 27 | 38 |
| LARVAL FEMALES | | | | |
| Idiosomal length | 230 | 208 | 197 | 188 |
| Idiosomal width | 171 | 160 | 128 | 128 |
| Cheliceral stylets | 37 | 41 | 44 | 36 |
| Pharynx width | 14 | 11 | 10 | 8 |
| Idiosomal setae | | | | |
| $v_1$ | 24 | 17 | 13 | 32 |
| $c_1$ | 14 | 15 | 20 | 16 |
| $c_2$ | 30 | 40 | 45 | 32 |
| $h_1$ | 185 | 100 | 73 | 160 |
| $h_2$ | 11 | 5 | 5 | 5 |
| Femur II seta *d* | 0 | 0 | 4 | 0 |
| Genu III seta *l''* | 0 | 0 | 8 | 10 |
| Dist. setae $h_1$–$h_1$ | 20 | 13 | 12 | 18 |

oped, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae thin, 1*a* and 2*a* 8–9, 3*b* 9–10.

*Legs:* Leg setation as in Table 1. Ambulacra I, II, III with moderately developed claws. Tarsus I solenidion ω 8. Tibia I solenidion φ 10, seta *k* 3. Tibiae I, II, III setae *d* 36, 35, 20 respectively. Genu I seta *v''* 6–8, *l''* 7–8, genu III seta *l''* 7–8.

Male (Fig. 2).—*Gnathosoma:* Length 28–35, width 27–37 (n = 4). Palp length 13–15; cheliceral stylet length 22–24, pharynx width 5–9; dorsal gnathosomal setae 5–8, ventral setae 7–8, distance between ventral setae 12.

*Idiosoma:* Length 139–180, width 123–157. Prodorsal plate length 45, width 88; setae $v_1$, $v_2$, $sc_1$ m; $sc_2$ 21–40. Distance between setae $v_1$ 14, $v_2$ medial to and $sc_1$ on a line connecting $v_1$ and $sc_2$. Setae $c_1$ 3, $c_2$ 5–8, *d* m-3 and *e* m. Genital capsule dorsal, length 24, width 30.

*Venter:* Apodemes 1 moderately developed, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae 1*a* 5–8, 2*a* 6–8, 3*b* 7.

*Legs:* Legs I, II, III, IV setation (including solenidia) for femur, genu, tibia, tarsus: 3-3-7-10, 0-2-4-7, 0-1-4-7, 0-0-2-4. Ambulacrum I claw 5–6, ambulacra II, III claws 3–5, no ambulacral IV claws. Femur I setae *v''* 10, no femur II setae *d* or femur III setae *v'*. Tarsus I solenidion ω 6. Tibia I solenidion φ m, seta *k* m. Tibiae I, II, III setae *d* 19, 17, 15 respectively. Tibia IV setae *d* m, setae *v''* spinelike 4: tarsus IV *pv'* m, *tc'* spinelike 5, *u'* spinelike 5.

Larval female (Fig. 3).—*Gnathosoma:* Length 36–42, width 29–38 (n = 5). Palp length 12–13; cheliceral stylet length 34–36, pharynx width 7–8; dorsal gnathosomal setae 25, ventral setae 11–12, distance between ventral setae 11–14.

*Idiosoma:* Length 149–188, width 105–128. Prodorsal plate length 72–75, width 88–97; setae $v_1$ 25–32, $v_2$ and $sc_1$ v, $sc_2$ 110–120. Distance between setae $v_1$ 17–29, $v_2$ slightly medial to and $sc_1$ slightly lateral to a line connecting $v_1$ and $sc_2$. Plate C and D fused, length 61–70, width 108–126; setae $c_1$ 14–16, setae $c_2$ 25–32, setae *d* 10. Plate EF length 28–30, width 40–48; setae

Table 2. Leg setation for femora, genua, tibiae, and tarsi for adult females of species in the genus *Dorsipes*, group *inflatus*. Setation for legs IV in males is similar in all *Dorsipes*: 0-0-2-4.

| | Leg I | | | | Leg II | | | | Leg III | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | G | Ti | Ta | F | G | Ti | Ta | F | G | Ti | Ta |
| *D. inflatus* | 3 | 3 | 7 | 10 | 0 | 2 | 4 | 6 | 0 | 0 | 4 | 6 |
| *D. notopus* | 3 | 3 | 7 | 10 | 0 | 2 | 4 | 5 | 0 | 1 | 4 | 6 |
| *D. curtonoti* | 3 | 3 | 7 | 10 | 1 | 2 | 4 | 7 | 1 | 1 | 4 | 6 |
| *D. amarae* | 3 | 3 | 7 | 10 | 0 | 2 | 4 | 7 | 0 | 1 | 4 | 5 |

*e* 30–38. Plate H length 20–23, width 25–30; setae $h_1$ 120–160, setae $h_2$ 3–5, distance between setae $h_1$ 15–18.

*Venter:* Apodemes 1 moderately developed, meeting sternal apodeme medially; apodemes 2 not extending to sternal apodeme. Coxal setae 1*a* 7–8, 2*a* 7–10, 3*b* 7–8.

*Legs:* Legs I, II, III setation for femur, genu, tibia, tarsus: 3-3-7-10, 0-2-4-6, 0-1-4-5. Ambulacra II, III with small claws, 2. Femur I seta *v*″ 12–14, tarsus I solenidion ω 7. Tibia I solenidion ϕ 10–12, seta *k* 3. Genu III seta *l*″ 8–10.

Egg.—Length 182–205, width 127–139 (n = 7).

Type, host, and locality data.—Holotype female (RWH80803-1), allotype male and 20 paratypes: from Tusayan National Forest, 8,000 feet, Flagstaff, Coconino County, Arizona, U.S.A. from hind wings, metanotum or abdominal tergites under the elytra of *Amara latior* Kirby (Carabidae), collected by T. H. and G. G. Hubbell, 2 September 1935.

Type deposition.—Holotype, allotype, 3 females, 1 male, 3 larvae, 7 eggs, paratypes, and 1 vial with mites in 70% ethanol deposited in UMMZ. Paratypes: 1 female, 1 male, 1 larval female and 1 vial of mites deposited in the collection of the senior author; 1 female, 1 male and 1 larva deposited in the Zoological Museum, University of Hamburg (ZMH), Hamburg, Germany; 1 female, 1 male and 1 larva deposited in the collection of Kazuyoshi Kurosa, Tokyo, Japan.

Etymology.—The specific name is derived from the generic name of the host insect.

## Discussion

*Dorsipes* is restricted to hosts in the family Carabidae (Coleoptera) and is found in Europe, N. America, Africa and Asia. The genus was reviewed and the *inflatus* group of *Dorsipes* discussed by Kurosa and Husband (2002). We find setae $v_2$ and $sc_1$ as vestigial or microsetae in all *Dorsipes*. In the *inflatus* group, seta $v_2$ varies in position from on a line drawn from seta $v_1$ to seta $sc_2$ to distinctly medial to this line depending on the instar and species. Likewise, seta $sc_1$ varies from being in line with setae $v_1$ and $sc_2$ to lateral to this line. Seta $sc_1$ varies from close to seta $sc_2$, 6, to distant from $sc_2$, more than 12. In respect to leg setation, adult female *D. inflatus* have the fewest setae (apomorphy), *D. notopus* and *D. amarae* have an intermediate number and *D. curtonoti* have the most setae (Table 2). A similar pattern occurs for larval females and males except larval *D. notopus* lack genu III setae.

### Key to Adult Females in the *Inflatus* Group of the Genus *Dorsipes*

1. Without femora II, III setae . . . . . 2
– With femora II, III setae . . . . . *D. curtonoti*
2. With genua III seta *l*″ . . . . . 3
– Without genua III seta *l*″ . . . . . *D. inflatus*
3. Stigmata and tracheal atria present, genu I seta *l*″ (m-3) shorter than ⅓ length of coxal setae (10–11) . . . . . *D. notopus*
– Stigmata and tracheal atria not present, genu I seta *l*″ (7–8) nearly as long as coxal setae (8–10) . . . . . *D. amarae*, n. sp.

Studies of the distribution and variation in *Dorsipes* from a variety of carabid beetles from the eastern and western hemispheres are in progress. The three groups of

*Dorsipes* currently include four *inflatus* species from Europe, Japan and the United States, four *dorsipes* species from Europe and Japan, and eight *platysmae* species from Europe, Africa and the United States.

## Acknowledgments

We are grateful to Barry O'Connor and Mark O'Brien, Museum of Zoology, University of Michigan, Ann Arbor, Michigan, for the loan of specimens of *Amara* (Carabidae) to search for *Dorsipes*.

## Literature Cited

Husband, R. W. and K. Kurosa. 2002. Two new species of *Dorsipes* (Acari: Podapolipidae) ectoparasites of *Carabus* spp. (Coleoptera: Carabidae) from Japan. International Journal of Acarology 28: 29–36.

Kurosa, K. and R. W. Husband. 2002. A new species of *Dorsipes* (Acari: Podapolipidae), ectoparasite of *Amara gigantea* (Coleoptera: Carabidae) from Japan. International Journal of Acarology 28: 147–155.

Lindquist, E. E. 1986. The world genera of Tarsonemidae (Acari: Heterostigmata): A morphological, phylogenetic, and systematic revision with reclassification of family group taxa in Heterostigmata. Memoirs of the Entomological Society of Canada 136: 1–517.

Regenfuss, H. 1968. Untersuchungen zur Morphologie, Systematik und Ökologie der Podapolipidae (Acarina: Tarsonemini). Zeitschrift für Wissenschaftliche Zoologie. Leipzig 177: 183–282.